

Failure Modes and Effects Analysis/Critical Items List

Document Number: JSC-38378 **Document Rev. No.:** C **Document Date:** 8/26/97
Title: Risk Assessment Executive Summary Report (RAESR) for the USA SAFER

Item Name: Thruster **Qty:** 24 **FMEA Number:** US-SFR-140
Item Part Number: B84138-1 **ORU Name:** SAFER
Subsystem Name: Propulsion **ORU Part Number:** SED33105900-311
Function: Provides propulsive impulse for translation and rotation.

Item Type Designator: C **PG/IP Identifier:** N/A
Reference Designator/Find No.: N/A **Drawing Number:** SED33105904
Logistics Control Number: N/A

End Item Name: SAFER
End Item Capability: Six degrees of freedom through 24 thrusters, each rated at 0.8 ± 0.08 lbs. force in vacuum.
End Item Function: Provides emergency EVA self-rescue for separated crewmember.
ISS Zone: EVA **Shuttle Zone:** EVA

Criticality

Critical Item: Yes: _____ No: X **Criticality Category:** ISS 1R Shuttle 1R/3
Success Paths: **Success Paths Remaining:**

Failure (Mode, Cause, Detection, Corrective Action)

Failure Mode: Thruster fails open.
Failure Mode Code:
Failure Cause: Avionics EEE part failure, return spring failure, contamination, piece-part failure.
Failure Detection:
 Flight: IVA – IVA checkout.
 EVA – Uncommanded motion; “Thruster On” light illuminated.
 Ground: Functional Test.
Time To Detect Quantity: 30 **Time To Detect Units:** Seconds
Correcting Action: IVA – If a failure is detected during the IVA checkout, the back-up SAFER (if available) will be used.
 EVA – Continue self-rescue.
Remarks: SAFER is not certified to handle control system “force fights” (firing additional thrusters to maintain control).
 However if this failure occurs it may be possible for the crewmember to make manual inputs to overcome the unwanted thrust and continue with the self rescue. All GN2 would leak through a single failed open thruster in approximately 4 minutes.
Failure Effect Phase: EVA Operations **Affected Stage(S):** EVA Operations

Failure Effect

On ORU/Assembly:
 First/Second Failure: Inadvertent EVA crewmember separation.
 Third (this) Failure: Uncommanded motion; “Thruster On” light illuminated.
On Subsystem/Next Assembly: Uncontrolled loss of GN₂.
On End Item/Segment: Uncommanded motion. Possible loss of mission objectives if SAFER required for EVA.
On Crew/ISS: Possible loss of EVA crewmember.
Time To Effect Quantity: 1 **Time To Effect Units:** Minutes

Redundancy Screen

ISS	(Shuttle)				
Checkout Pre-Launch	(A):	Pass			
Checkout On-Orbit	(B):	N/A			
Detection Flight Crew:		Pass	Or	Detection Ground Crew:	Fail
Loss Of Redundancy From A Single Cause	(C):	N/A			